

Dealing with Scientific Misconduct in the Future

ROLE OF EDITORS AND JOURNALS IN DETECTING AND PREVENTING SCIENTIFIC MISCONDUCT: STRENGTHS, WEAKNESSES, OPPORTUNITIES, AND THREATS

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Abstract: Scientific journals have a central place in protecting research integrity because published articles are the most visible documentation of research. We used SWOT analysis to audit (S)trengths and (W)eaknesses as internal and (O)pportunities and (T)hreats as external factors affecting journals' responsibility in addressing research integrity issues. Strengths include editorial independence, authority and expertise, power to formulate editorial policies, and responsibility for the integrity of published records. Weaknesses stem from having no mandate for legal action, reluctance to get involved, and lack of training. Opportunities for editors are new technologies for detecting misconduct, policies by editorial organization or national institutions, and greater transparency of published research. Editors face threats from the lack of legal regulation and culture of research integrity in academic communities, lack of support from stakeholders in scientific publishing, and different pressures. Journal editors cannot be the policing force of the scientific community but they should actively ensure the integrity of the scientific record.

Keywords: Editors; journals; research integrity; scientific misconduct; SWOT analysis

Trust but verify.
Damon Runyon,
American journalist
(1884-1946)

Ideally, the whole enterprise of scientific research is based on trust: the public trusts science and scientists because of their contribution to humanity, scientists

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trust each other because collaboration is an essential requirement for research, and granting bodies trust scientists and fund their research ideas even if there is no guarantee that research will be successful. Journal editors trust their authors that they have submitted original and valid work. And finally, to close the circle of trust - the readers trust scientific journals that they have done their best to select the most important research in the field.

Despite the fact that the whole scientific community is responsible for the integrity of scientific discovery, it is scientific journals that are usually the place where the breach of trust - scientific misconduct - is discovered^{1,2}. This is because scientific publication is perhaps the best documentation of the actions of scientists involved in particular research and best visible to the scientific and general public¹. This is also the reason why the focus of the public, and often the blame, is on the journals and their editors and reviewers³. Judging from newspaper titles, such as "For Science's Gatekeepers, a Credibility Gap"⁴, public perception is often that editorial and peer review processes fail to protect the integrity of science⁵. Because editors are the first to face the "disease" of scientific fraud, they are blamed for failure to protect from the disease. This is analogous to the differing roles of prevention and treatment in medicine and public health. A scientific journal is the place where the disease is diagnosed. However, the causes of this disease are not in the journals themselves, but in the whole scientific community. Just as one does not blame the x-ray machine for displaying a bone fracture, journals and editors should not be the sole recipients of the blame when fraudulent or irresponsible research is published. In terms of health, preventing diseases is always better than treating them, and this has been true from the beginning of medicine. To quote Galen, the founder of modern medicine: "Since, both in importance and in time, health precedes

1. Claxton LD. Scientific authorship. Part 1. A window into scientific fraud? *Mutat Res.* 2005;589:17-30.

2. Claxton LD. Scientific authorship. Part 2. History, recurring issues, practices, and guidelines. *Mutat Res.* 2005;589:31-45.

3. Marusic A, Marusic M. Killing the messenger: should scientific journals be responsible for policing scientific fraud? *Med J Aust.* 2006;184:596-597.

4. Altman LK. For science's gatekeepers, a credibility gap. *New York Times* 2006 2 May; The Doctor's World: 1.

5. Gerber P. What can we learn from the Hwang and Sudb? affairs? *Med J Aust.* 2006; 184:632-635.

the disease, so we ought to consider first how health may be preserved, and then how one may best cure disease.” Health of the scientific endeavor - the responsible conduct of research - should be preserved by active and preventative work of all stakeholders - researchers themselves, their institutions, policy makers, granting bodies, scientific journals, and the public.

As journal editors have a central position in communicating research, they also have the most important role in ensuring the integrity of its published record. If we liken the editors to public health workers, they then have an important role in preventing, detecting, and dealing with scientific misconduct and questionable research practices. To analyze their current position and explore future possibilities, we will apply SWOT analysis - a technique often used to analyze a specific situation and develop suitable strategies and tactics, assess core competencies and capabilities, and provide evidence for change^{6, 7}. SWOT stands for Strengths and Weaknesses (representing internal resources and capabilities), and Opportunities and Threats (representing factors external to the organization or group).

Strengths

In recent disclosures of fraudulent research, the public questioned the credibility of journal editors and reviewers, stating that journal editors “shift the blame to the authors and excuse themselves and their peer reviewers”⁴ or that “the current manner of peer reviewing research articles provides no assurance that the proffered work is not the result of fraud”⁵.

However, we will argue here that journal editors, among all stakeholders in research integrity, have due expertise in research integrity issues and have made a major contribution in formulating and implementing editorial policies that go beyond publication ethics. Other strengths of editors in promoting and preventing research misconduct are their independence as editors and, at the same time, authority in the scientific community, and formal responsibility for the integrity of the published record.

6. Gordon J, Hazlett C, Ten Cate O, Mann K, Kilminster S, Prince K, O’Driscoll E, Snell L, Newble D. Strategic planning in medical education: enhancing the learning environment for students in clinical settings. *Med Educ.* 2000;34:841-850.

7. Huerta M, Balicer RD, Leventhal A. SWOT analysis: strengths, weaknesses, opportunities and threats of the Israeli Smallpox Revaccination Program. *Isr Med Assoc J.* 2003;5:42-6.

Editorial independence

Editorial independence is the prerequisite for editorial involvement in research integrity issues. This independence is very important for medical editors, who often face pressures from their owners, publishers, as well as commercial enterprises⁸. Editorial freedom is not important only for ensuring the validity of the published work but also for the transparency of all procedures guarding against different conflicts of interest. Editorial independence is something that did not come easily to editors of medical journals, both in large^{9, 10} and small journals¹¹.

Editorial freedom and independence gives editors the means for ensuring responsible publishing in their journals. According to the World Association of Medical Editors (WAME) policy statement⁸, editors “should resist any actions that might compromise these principles in their journals, even if it places their own position at risk.”

Authority in the scientific community

Most medical editors are also respected professionals in their academic or research community. This gives them strength to promote responsible conduct of research and publishing and to serve as educators of their scientific community¹². In some countries, editors have been major factors in the development of research integrity policies at the country level. An example is our journal, Croatian Medical Journal, published in a small scientific community burdened by many adverse factors, including the legacy of corruption and

8. World Association of Medical Editors. The Relationship Between Journal Editors-in-Chief and Owners (formerly titled Editorial Independence). Available at www.icmje.org/resources/policies (originally posted June 19, 2000; modified version posted May 15, 2006). Last accessed: August 1, 2007.

9. Goldsmith MF. George D. Lundberg ousted as *JAMA* editor. *JAMA*. 1999;281:403.

10. Mitka M. NEJM editor Jerome P. Kassirer, MD, loses post over “administrative issues”. *JAMA*. 1999;282:622-623.

11. Marusic M, Bosnjak D, Rulic-Hren S, Marusic A. Legal regulation of the Croatian Medical Journal: model for small academic journals. *Croat Med J*. 2003;46:663-673.

12. Marusic M, Marusic A. Good editorial practice: editors as educators. *Croat Med J*. 2001;42:113-120.

egalitarianism in the post-communist transition period¹³. Recognizing the importance of research integrity for a small and vulnerable community of scientists, and learning about the work of the agencies promoting research integrity¹⁴, we set it as our goal to promote these issues at all levels of our work: working with authors¹⁵, working with medical students and medical researchers¹⁶, and informing the policy makers about the need for public engagement in promoting and ensuring responsible conduct of research¹⁴.

Expertise in research integrity issues

Among stakeholders in research integrity, editors are rather unique in their efforts for continual evaluation of their own work and practices. In an effort to base their action on evidence, editors have been pioneers in collecting evidence about all aspects of scientific publishing, including research integrity¹⁷. The best example are the Peer Review Congresses¹⁸, which have grown from a small gathering of editors in 1989¹⁹ to a respectable field of research, as judged by the increase in the number of reports submitted to the Conferences and the number of published research articles (Figure 1).

Power to formulate and implement editorial policies

Perhaps the greatest power of journal editors is their responsibility and privilege to formulate and implement editorial policies to ensure the validity, objectivity, fairness and transparency of the publishing process in science. For the last 50 years (the age of the oldest professional editorial organization, Council of Science

13. Scheetz MD. Office of Research Integrity: a reflection of disputes and misunderstandings. *Croat Med J.* 1999;40:321-5.

14. Katavic V. Five-year report of Croatian Medical Journal's Research Integrity Editor - policy, policing, or policing policy. *Croat Med J.* 2006;47:220-227.

15. Petroveckı M, Scheetz MD. Croatian Medical Journal introduces culture, control, and the study of research integrity. *Croat Med J.* 2001;42:7-13.

16. Marusic A, Marusic M. Teaching students how to read and write science: mandatory course on scientific research and communication in medicine. *Acad Med.* 2003;78:1235-1239.

17. Smith R, Rennie D. And now, evidence based editing. *BMJ.* 1995;311:826.

18. Rennie D, Flanagan A. Congress on Biomedical Peer Review: history, ethics, and plans for the future. *JAMA.* 1998;280:213.

19. Council of Biology Editors: Peer review in scientific publishing. Chicago: CBE, 1991.

Editors; ref 20), editorial organizations have been instrumental in defining and implementing policies and best practices in scientific publishing. Medical editors are particularly active in addressing the issues of research integrity and scientific misconduct because fraudulent reporting in medicine may have direct effect on human lives. Table 1 lists major professional editorial organizations and their policies outlining ethical issues and editorial responsibilities.

The need for clear ethical guidelines and adherence to them has been recently emphasized in the finding of an external committee that investigated how Science handled the two articles on stem cell research by W. S. Hwang and his colleagues, shown to be a clear case of fraud that could have been caught with more editorial vigilance²¹. Among other suggestions, the Committee made the recommendation that high-profile journals, including Science and Nature, should come together and establish common standards for ensuring data integrity. This “elitist recommendation”²² should be worrying for editors because they obviously failed to communicate to their authors and readers (including members of the external committee) that the policies for good practice in scientific journals already exist. This case also illustrates how strength (policies) can at the same time be a weakness, when editors obviously did not succeed in informing the community about their work.

Responsibility for the integrity of published records

Editors are not, could not, and should not be the policing force of science and scientific community²³⁻²⁵, but they can contribute to research integrity and ensure

20. Krischer D. CSE's first 50 years: Blazing the trail for science editors everywhere. *Sci Ed*. 2006;30:39-41.

21. Brauman J, Gearhart J, Melton L, Miller L, Partridge L, Whitesides G. Supporting online material. Committee report. Available at: <http://www.sciencemag.org/cgi/data/314/5804/1353/DC1/1>. Accessed: August 1, 2007.

22. Rossner M. Hwang case review committee misses the mark. *J Cell Biol*. 2007;176(2):131-132.

23. Brice J, Bligh J. Author misconduct: not just the editors' responsibility. *Med Educ*. 2005;39:83-89.

24. Bennett DM, Taylor D McD. Unethical practices in authorship of scientific papers. *Emerg Med*. 2003;15:263-270.

25. Freshwater D. Editors and publishing: integrity, trust and faith. *J Psychiat Ment Health Nurs*. 2006;13:1-2.

the trust of the public by enforcing their major responsibility - the integrity of the published record in science^{26,27}. The recent CSE White Paper on Promoting Integrity in Scientific Journal Publications²⁸ defined in detail different types of correcting the literature and defined the responsibilities of editors in this process.

The editor should publish the correction as soon as reasonably possible, but timely correction may be hindered by the tardiness of the official investigation of scientific misconduct, as it usually takes a long time for the conclusion of the investigation²⁸. According to the Ethics Flowcharts²⁹ of the Council for Publication Ethics (COPE), the editor can publish literature correction if the response from the authors is not satisfactory, as well as if there is no response from the institution or relevant authority in a reasonable time period.

Retractions are easily identified in the major bibliographic database in medicine, Medline/PubMed because they are assigned a special publication type tag (“Retracted Publication [PT]”). Also, the list or all citations identified and tagged as a retracted publication can be accessed using the Special Queries tool of the PubMed, available at http://www.nlm.nih.gov/bsd/special_queries.html. At the time of writing this article, there were 827 retractions in the PubMed (Table 2). Retractions were common in some but not all large and prestigious medical and life-science journals (Table 1). The reasons why some journals have few retractions and others much more, especially in relation to the number of published articles, are not clear and certainly warrant further investigation.

In the absence of action from authors or responsible institutions or bodies, editors can use another form of literature correction before the final decision on retraction of correction - “expressions of concern” about the conduct or

26. Budd JM, Sievert M, Schultz TR, Scoville C. Effects of article retraction on citation and practice in medicine. *Bull Med Libr Assoc.* 1999;87:437-443.

27. Sox H, Rennie D. Research misconduct, retraction, and cleansing the medical literature: lessons from the Poehlman case. *Ann Intern Med.* 2006;144:609-613.

28. Council of Science Editors. CSE’s White Paper on Promoting Integrity in Scientific Journal Publications. Reston (VA): CSE, 2006. Available at: http://www.councilscienceeditors.org/editorial_policies/white_paper.cfm. Accessed: August 1, 2007.

29. Graf C, Wager E, Bowman A, Fiack S, Scott-Lichter D, Robinson A. Best Practice Guidelines on Publication Ethics: a publisher’s perspective. *Int J Clin Pract Suppl.* 2007;(152):1-26.

integrity of the work^{28,30}. Table 3 shows how often the editors of major medical and life-sciences journals (the same in Table 2) have used this form of editorial action as their contribution to the query into the integrity of the published record. As with retractions, the journals differ in their practices of expressing concern about published research. Editors are not afraid to make a correction of their statement if they think it is in order, illustrated by the example of a “retracted expression of concern” (Table 3).

Weaknesses

The weaknesses of editors in addressing scientific misconduct are closely related to their strengths because they often do not use the strengths to their advantage, for a number of reasons.

No mandate for legal actions

Journal editors do not have the mandate or resources to conduct a formal judicial inquiry or to make formal judgments about allegations of scientific misconduct³¹. What they can do, in order to protect the integrity of the public scientific record, is to share their concerns with the authorities - authors' employer(s), university, granting agency, or regulatory body³¹. Many editors are reluctant to investigate cases arising in their journals because they are sometimes threatened by legal actions²⁷. Few journals have a system to monitor research integrity issues and regularly report on their activities^{14,32}. More often, editors may share their concerns with authorities but these may not respond at all or respond in an inappropriate or untimely fashion^{33,34}, making it difficult for the journal editors to protect the integrity of the public scientific record. The

30. International Committee of Medical Journal Editors. Uniform Requirements for Manuscripts Submitted to Biomedical Journals Writing and Editing for Biomedical Publication. Available at: <http://www.icmje.org/>. Accessed August 1, 2007.

31. World Association of Medical Editors. WAME Publication Ethics Policies for Medical Journals - WAME Recommendations on Publication Ethics Policies for Medical Journals. Responding to Allegations of Possible Misconduct. Available at: <http://www.wame.org/resources/publication-ethics-policies-for-medical-journals#misconduct>. Accessed: August 1, 2007.

32. Wager E. Experiences of the BMJ ethics committee. *BMJ*. 2004;329:510-512.

33. Chalmers I. Role of systematic reviews in detecting plagiarism: case of Asim Kurjak. *BMJ*. 2006;333:594-596.

34. Brumfiel G. Misconduct? It's all academic... *Nature*. 2007;445:240-241.

worst scenario for editors is when there is no official authority for reporting their concerns³⁵.

Reluctance to get involved in delicate issues

Editors may not want to get involved in allegations of scientific misconduct not only because of legal problems but because such cases are delicate and sensitive. This is often the case for editors who work in small scholarly journals. Already burdened by professional obligations and working voluntarily as a journal editor in an academic community that refuses to get involved in research integrity issues³⁴, an editor's typical mechanism of defense is denial. This is particularly true for journals in small scientific communities, where editors are also active researchers and personally know or have collaborated with most of the researchers in the community. We have encountered such behavior in several of the cases from our journal, the *Croatian Medical Journal*¹⁴. In cases where we needed the response from an editor, the most common reaction was - no response at all. As there are no professional bodies for regulating and monitoring editorial work, there are also no adverse consequences for editors who simply refuse to deal with research integrity issues. The only organization that obliges its members to a code of conduct and any possible consequences in processing allegations against editors is the Committee on Publication Ethics (COPE), but its policies and procedures oblige only COPE member journals²⁹.

Few means of action

Editors have two ways of reacting to the findings of research misconduct: they can correct the literature and they can alert the institutions or organizations of authors found to be involved in the allegation of misconduct. Although these actions constitute the strengths of editors, they often do not use it for the benefit of their journals and scientific community. A recent investigation into retraction policies and practices in 122 high-impact biomedical journals³⁶ showed that only 4 journals had statements about their retraction policies on their websites, and that 78% of them had no policy on issuing retractions. Even if the retractions are published and clearly tagged in the Medline/PubMed, they continue to be

35. Smith R. Investigating the previous studies of a fraudulent author. *BMJ*. 2005;331:288-291.

36. Atlas MC. Retraction policies of high impact biomedical journals. *J Med Libr Assoc*. 2004;92:242-250.

cited, often in either implicitly or explicitly positive mention of the retracted research^{26, 27}.

Possible damage to journal's reputation

Laxity in the corrections of published literature and reluctance to get involved in cases of misconduct is often related to the perception that such actions would bring damage to the journal's reputation. Although there is no formal research into this matter, behavior of journals in several well-publicized cases clearly show that journals often do not get involved not only by ignoring their responsibilities but often by actively evading involvement or action. For example, in the case of 47 articles with manipulated or invented data from two German researchers, published in 19 journals, a follow-up of the journals' reactions to official findings of misconduct showed that only 2 of these journals retracted the articles, a half of the journals never responded to the query, and those that replied stated that they had no knowledge about misconduct findings and that the retraction was the responsibility of the authors³⁷. One of the reasons for the laxity in correcting the published literature is a common misconception among editors that authors must write and approve a retraction. However, literature corrections can be made by different authorities, such as authors, editors, publishers, department chairpersons, institution heads, laboratory directors, or legal counsel⁸, and there are examples of different types of literature correction in Medline/PubMed²⁸.

Lack of education and staff to implement adequate procedures

Although the procedures, policies, and codes are available to editors, and their journals officially subscribe to them, there is a great precipice between the formal acceptance of and actual adherence to rules and procedures. Many journals subscribe to international editorial policies only formally, without real implementation. This is true not only for small, scholarly journals from small communities but also for large and financially well-off journals. Journal's vigilance in research integrity issues is a demanding activity, both in personnel and funds³⁸, and journals often cannot afford them. For example, only the largest

37. Cooper-Mahkorn D. Many journals have not retracted "fraudulent" research. *BMJ*. 1998;316:1850.

38. Rossner M, Yamada KM. What's in a picture? The temptation of image manipulation. *J Cell Biol*. 2004;166:11-15.

medical journals have dedicated staff for verification of registration data for each trial submitted to the journals, according to the ICMJE policy on trial registration³⁹.

Even when journals have trained staff and techniques, they may still perform poorly in detecting evident fraud. Mike Rossner, managing editor of the *Journal of Cell Biology* and a pioneer in addressing image manipulations in scientific journals, recently recounted his experience, albeit indirect, with the Hwang stem cell fraud case from the *Science*²². His staff at the *Journal of Cell Biology*, a journal that systematically screens all images in accepted articles³⁸, trained *Science* editors in image screening, but the *Science* insists that these methods would not have discovered the manipulations in Hwang's article.

Opportunities

Regardless of the "smallness" of his or her journal, organizational, financial, or staff problems, a conscientious journal editor today has many opportunities to prevent, detect, and investigate research misconduct, as well as to promote responsible conduct of research.

Editors are well positioned to detect scientific misconduct

Regardless of possibly adverse conditions for their journals, editors are often the first or the only public body that discovers or is alerted about indications for fraudulent research. Only by ensuring the validity of the published record in a transparent and responsible manner, editors can keep the trust of the scientific community and the public.

Availability of new technologies for detecting misconduct

Even an understaffed and financially less privileged journal editor has at his or her hand a number of electronic tools for checking the integrity of the published articles. For example, Office of Research Integrity (ORI) of the US Department of Health and Human Services, offers free electronic tools for examining electronic images in articles (http://ori.dhhs.gov/tools/data_imaging.shtml). They

39. De Angelis CD, Drazen JM, Frizelle FA, Haug C, Hoey J, Horton R, Kotzin S, Laine C, Marusic A, Overbeke AJ, Schroeder TV, Sox HC, Van Der Weyden MB. Is this clinical trial fully registered? A statement from the international committee of medical journal editors. *Croat Med J.* 2005;46:499-501.

are easy to use and do not require extensive training. ORI also offers very useful tips for addressing suspicious numerical data (http://ori.hhs.gov/misconduct/Tips_StatisticalForensics.shtml and http://ori.hhs.gov/misconduct/Tips_StatisticalForensics2.shtml).

In small journals and small scientific communities, plagiarism is a common form of misconduct^{33,40}, often related to the pressure to publish in circumstances of inadequate funds. Thus, small journals should be especially vigilant in protecting against duplicate publications or outright plagiarism¹⁴. In the past, a journal could rely only on a knowledgeable and well-read reviewer to notice overlap of articles. Today, there are free programs on the web that can search for similar texts. For example, the Eblast web-program (<http://invention.swmed.edu/etblast/etblast.shtml>) searches the PubMed not by keywords (the PubMed search strategy), but for whole paragraphs, and returns PubMed abstracts that are similar to a large extent⁴¹. Apart from this free web-service, there are a number of commercial software solutions for detecting plagiarized articles.

Editorial policies developed by editorial organizations

Editorial policies (Table 2) were described as the internal strength of the editorial profession to ensure the integrity of scientific communication. Even for an editor working in isolation, outside of formal editorial organizations, these policies provide both guidance and protection in their community. We can personally testify to the importance of international editorial policies for editors in a small academic community burdened by the lack of knowledge about handling misconduct, or by personal conflicts and academic hypocrisy. Our journal has successfully resolved two cases of redundant publications^{42,43} by prompt action

40. Bilic-Zulle L, Frkovic V, Turk T, Azman J, Petroveckii M. Prevalence of plagiarism among medical students. *Croat Med J.* 2005;46:126-131.

41. Lewis J, Ossowski S, Hicks J, Errami M, Garner HR. Text similarity: an alternative way to search MEDLINE. *Bioinformatics.* 2006;22:2298-2304.

42. Marusic M. Notice of retraction: "What do contrast media add to three-dimensional power Doppler evaluation of adnexal masses?" (*Croat Med J.* 2000;41:257-61). *Croat Med J.* 2007;48:145.

43. Marusic M. Notice of Retraction: "Intervillous blood flow in patients with missed abortion" (*Croat Med J.* 1998;39:41-4). *Croat Med J.* 2007;48:390.

and adherence to international rules for handling misconduct allegations in journals²⁹.

Policies developed by national ethics/integrity bodies

In countries where they exist, policies for promoting responsible conduct of research and procedures for handling misconduct allegations are a great opportunity for editors who take an active part in protecting and promoting the integrity of research published in their journals. The oldest governmental bodies charged with handling misconduct cases are Research Integrity Committees in the Nordic countries - Denmark, Norway, Sweden and Finland⁴⁴. They were followed by the development of the Office for Research Integrity in the USA, addressing biomedical research¹³, and a similar office at the National Science Foundation for other fields of science. Such bodies, of varying structures, mandates, and responsibilities exist in many countries, including Germany⁴⁵, Switzerland⁴⁶, India³⁴, Japan³⁴, China⁴⁷, UK²⁸, and Croatia⁴⁸, and in other countries, such as Canada, journal editors and other stakeholders in research enterprise make urgent calls for such a body⁴⁹.

Research integrity bodies have different mandates and legal frameworks for their actions in different countries, but they provide an important opportunity for journal editors in pursuing their concerns about work submitted to their journals. Editors cannot conduct legal inquiries into possible scientific misconduct and have to rely on other authorities, which often take a long time to conclude misconduct investigations or never respond to editor's communications or concerns³³⁻³⁵. In such cases, editors could turn to a national research integrity body, which should ensure that there is adequate procedure for handling allegations of scientific misconduct at all levels of research and academic

44. Nylenna M, Andersen D, Dahlquist G, Sarvas M, Aakvaag A. Handling of scientific dishonesty in the Nordic countries. National Committees on Scientific Dishonesty in the Nordic Countries. *Lancet*. 1999;354:57-61.

45. Abbott A. Germany tightens grip on misconduct... *Nature*. 1997;390:430.

46. Swiss Academy of Medical Sciences. Integrity in science. *Swiss Med Wkly*. 2003;133:52-58.

47. Jia H. Frequent cases force China to face up to scientific fraud. *Nat Med*. 2006;12:867.

48. Puljak L. Croatia founded a national body for ethics in science. *Sci Eng Ethics*. 2007;13:191-193.

49. Kondro W, Hebert PC. Research misconduct? What misconduct? *CMAJ*. 2007;176:905.

infrastructure. For editors, especially in small scientific communities, this line of action may provide at least some protection from the adverse reactions from their local academic or research communities, as they often experience the fate of research integrity whistleblowers¹⁴.

Greater transparency of publications on the web

In the past, searching the literature involved cumbersome and time-consuming tasks of going through huge print issues of bibliographical databases. Today, free access to the largest medical bibliographical database, Medline/PubMed, and availability of full text articles on the web is an opportunity for editors to use it in promoting the integrity of their journals. Journals may use special software solutions to search for content similarities, but even the use of the PubMed feature “Related Links”, which appears with each retrieved citation, can help in identification of potential overlapping, duplicate, or plagiarized publications. Although “Related Links” feature was not developed to aid editors in detecting fraud but to help researchers find articles on a similar topic, it is a great aid for a vigilant editor to spot possible misconduct.

Greater transparency of literature corrections on the web

In the “paper only” age of scientific journals, retractions and corrections were difficult to retrieve. Today, electronic databases specifically tag such items, and PubMed developed a special feature and publication categorization to retrieve all retractions and corrections (Tables 2 and 3). There are also programs, like eXtyles from Inera in the US, which checks each reference in an article against PubMed and specifically tags citations that were retracted. Such tools are useful not only for editors but also for authors to ensure the integrity of the work they cite. Some editors call for mandatory requirements to authors to attest that they have checked manuscript’s references against the PubMed master list²⁷.

Threats

There are many threats facing journal editors actively engaged in promoting research integrity and detecting scientific misconduct.

Lack of legal regulation and culture of research integrity in the scientific community

Regardless of the size, influence, and financial means of a journal, absence of

a legal framework for their activity and poor culture of responsible conduct of research in the community are serious threats to the integrity of the journal and editor. In the absence of norms which can be enforced, authors will continue to cite retracted articles²⁷ or refuse to retract or correct reports of their own work^{34, 37}, whereas institutions or other journals will not answer queries from editors^{14, 33, 35}. Editors will be drawn into the vicious circle of irresponsible science, work in frustration³⁵ or burn out as ill-treated whistleblowers³⁴.

Corruption of the scientific community and society

The vicious circle of disregard for responsible conduct of research is a major threat for editors working in many academic communities³⁴. This is true not only for small or financially less privileged communities, but also for academic communities in the richest countries. Academic communities are known for “capriciousness and incomplete” handling of misconduct cases, where even the deans from renowned universities may fall victims to the whistleblower’s syndrome³⁴.

We have the experience of editors from a country undergoing socioeconomic transition from the communist state⁵⁰, where, like in all countries with similar history, corruption and cheating the state have been firmly rooted among the people⁵¹. We did not expect that our decision to actively promote research integrity of the Croatian medical academic community through the journal⁵ would result in such animosity and finally open threats and allegations to discredit our integrity as researchers, especially because we did not ask for official processing of our findings but tried to educate the authors so that they wouldn’t make the same mistakes again¹⁴. When a major case of research misconduct of a Croatian researcher was made public in international literature³³, we were accused of being the ghost authors of the article in the international journal. We were asked to “stop further attacks from the *BMJ*” and threatened that the “whole system will be used” in destroying our academic and research careers⁵².

50. Marusic A, Marusic M. Small scientific journals from small countries: breaking from a vicious circle of inadequacy. *Croat Med J.* 1999;40:508-514.

51. Hrabak M, Vujaklija A, Vodopivec I, Hren D, Marusic M, Marusic A. Academic misconduct among medical students in a transition country. *Med Edu.* 2004;38:276-285.

52. Hem E. With an open window to the world. [In Norwegian] *Tidsskr Nor Laegeforen.* August 2007; in press.

Only the strength and transparency of journal policies, the availability of international expertise, and a legal framework for handling scientific misconduct at the highest state level⁵⁰ protected us to some extent.

No training available

In many communities, there is little or no systematic training available not only for editors but for researchers in general. Many editors work in isolation of their unsupporting scientific and academic communities and are not aware of the opportunities for them to actively engage in promoting research integrity. Particularly dangerous is common lack of education and training in responsible conduct of research for future researchers, for whom often the only opportunity to learn about research integrity is to watch their mentors and superiors⁵³.

Lack of support from stakeholders in scientific publishing

Editors are threatened not only by the lack of positive atmosphere for research integrity in their academic or research communities, but also by the lack of support and training from other stakeholders in journal publishing - professional associations and publishers. While some major publishers are actively engaged in promoting responsible editorial practices for their member journals²⁹, most other journals, published by small learned and scholarly associations and institutions, are left without any support^{11, 50}.

Pressures on editors and journal

The publishing business is the threat for editors by the very nature of the process, especially when financial conflicts of interest are involved. Journal editors have been fired over disagreements, either political or financial, and conflicts between the journal owners and editors^{9, 10}. In medicine, financial interests of the pharmaceutical industry are perhaps the biggest threat to the integrity of the editorial position in promoting responsible conduct of research.

Conclusions and recommendations

Using SWOT analysis, we analyzed the role of scientific journals and their editors in promoting research integrity, and assessed their core competencies

53. De Vries R, Anderson MS, Martinson BC. Normal misbehavior: scientists talk about the ethics of research. *J Empir Res Hum Res Ethics*. 2006;1:43-50.

and capabilities. When journal editors are regarded as a profession, their strengths and opportunities are definitely greater than their own weaknesses and threats from outside. However, the weaknesses of individual editors and threats imposed to them from their environment may outweigh their strengths and opportunities. The weaknesses of editors of small and scholarly journals usually stem from their ignorance of opportunities for continuing education in a rapidly changing publishing world⁵⁴. Editors of large journals often have great strength and are up to date with all opportunities provided by the editorial profession, but these can still be overridden by the threats stemming from commercial pressures of their publishers and stakeholders, such as pharmaceutical companies¹⁰.

With their central position in the communication of research in the scientific community, editors can and should do more, and individual weaknesses or external threats should not be an obstacle for taking an active part in promoting research integrity and preventing irresponsible research practices and scientific misconduct. Using the analogy with the x-ray machine, editors cannot be blamed for the bone fracture because they produce an x-ray image, but, as good doctors, they can ensure that they use the best technology to detect even the smallest of cracks and act to prevent a serious fracture. We can also make the analogy of scientific misconduct with the economic rationalization for crime if we consider scientific fraud as a “rational act of balancing the expected utility of scientific promotion against the expected cost of punishment”⁵⁵. To achieve a fraud-free equilibrium in science, all stakeholders must ensure that the cost of fraud and assisting in fraud is high and that of informing about and processing fraud low⁵⁵. The role of journal editors, both as individuals and as a profession, in this is - to learn, to stay informed, and to teach^{12, 50, 56}. They have to preserve the trust in their authors, but also make sure that they do their best in promoting the integrity of the published record of research. Weaknesses and threats cannot be an excuse for doing nothing. Edmund Burke, an Irish orator, philosopher, and politician (1729-1797) said: “No one could make a greater mistake than he who did nothing because he could do only a little.” This is an important message

54. Kljakovic-Gaspic M, Petrak J, Rudan I, Biloglav Z. For free or for fee? Dilemma of small scientific journals. *Croat Med J.* 2007;48:292-299.

55. Becker G. Crime and punishment: an economic approach. *J Polit Econ.* 1968;76:169-217.

56. Gollogly L, Momen H. Ethical dilemmas in scientific publication: pitfalls and solutions for editors. *Rev Saude Publica.* 2006;40 Spec no.:24-29.

for editors, just as another Burke's famous saying: "All that is necessary for the triumph of evil is that good men do nothing."

Table 1. Ethical guidelines and codes of conduct for biomedical journals

Editorial organization	Document
Council of Science Editors (CSE)	White Paper on Promoting Integrity in Scientific Journal Publications [http://www.councilscienceeditors.org/editorial_policies/white_paper.cfm]
European Association of Science Editors (EASE)	Science Editors' Handbook – Ethical issues [http://www.ease.org.uk/ese.html]
International Committee of Medical Journal Editors (ICMJE)	Uniform Requirements for Manuscripts Submitted to Biomedical Journals: Writing and Editing for Biomedical Publication [www.icmje.org]
World Association of Medical Journal Editors (WAME)	Policy Statement on the Responsibilities of Medical Editors [http://www.wame.org/resources/policies/]
Committee on Publication Ethics (COPE)	Guidelines on Good Publication and the Code of Conduct [http://www.publicationethics.org.uk/guidelines]

Table 2. Retractions in major biomedical journals, recorded in Medline, July 1, 2007

Journal	No. retractions	No. indexed articles
General medical journals:		
<i>New Eng J Med</i>	13	58,831
<i>Lancet</i>	10	115,306
<i>BMJ</i>	6	44,504
<i>Annals of Internal Medicine</i>	3	24,782
<i>JAMA</i>	1	58,392
Major life-science journals:		
<i>Science</i>	55	56,069
<i>Proceedings of the National Academy of Sciences USA</i>	40	89,031
<i>Nature</i>	35	82,374
<i>Cell</i>	15	13,203

Table 3. Editorial expression of concern about research published in major journals*

Journal	Reference
<i>New England Journal of Medicine</i>	Curfman GD, Morrissey S, Drazen JM. Expression of concern: Sudbo J <i>et al.</i> DNA content as a prognostic marker in patients with oral leukoplakia. <i>N Engl J Med</i> 2001;344:1270-8 and Sudbo J <i>et al.</i> The influence of resection and aneuploidy on mortality in oral leukoplakia. <i>N Engl J Med</i> 2004;350:1405-13. <i>N Engl J Med.</i> 2006;354(6):638.
	Curfman GD, Morrissey S, Drazen JM. Expression of concern: Bombardier <i>et al.</i> , "Comparison of upper gastrointestinal toxicity of rofecoxib and naproxen in patients with rheumatoid arthritis," <i>N Engl J Med</i> 2000;343:1520-8. <i>N Engl J Med.</i> 2005;353:2813-4. (Followed by: Reicin A, Shapiro D. Response to expression of concern regarding VIGOR study. <i>N Engl J Med.</i> 2006;354:1196-9. Bombardier C, Laine L, Burgos-Vargas R, Davis B, Day R, Ferraz MB, Hawkey CJ, Hochberg MC, Kvien TK, Schnitzer TJ, Weaver A. Response to expression of concern regarding VIGOR study. <i>N Engl J Med.</i> 2006;354:1196-9. Curfman GD, Morrissey S, Drazen JM. Expression of concern reaffirmed. <i>N Engl J Med.</i> 2006;354:1193.)
	Drazen JM, Ingelfinger JR, Curfman GD. Expression of concern: Schiff H, <i>et al.</i> Daily hemodialysis and the outcome of acute renal failure. <i>N Engl J Med</i> 2002;346:305-10. <i>N Engl J Med.</i> 2003;348:2137. (Followed by: Drazen JM, Ingelfinger JR, Curfman GD. Removal of expression of concern: Schiff H, <i>et al.</i> Daily hemodialysis and the outcome of acute renal failure. <i>N Engl J Med</i> 2002;346:305-10. <i>N Engl J Med.</i> 2003;349:1965.)
<i>The Lancet</i>	Horton R. Expression of concern: Non-steroidal anti-inflammatory drugs and the risk of oral cancer. <i>Lancet.</i> 2006;367:196.
	Horton R. Expression of concern: Indo-Mediterranean Diet Heart Study. <i>Lancet.</i> 2005;366:354-356.
<i>BMJ</i>	[No authors listed] Expression of concern. <i>BMJ.</i> 2005;331:266. (Regarding: Singh RB <i>et al.</i> Randomised controlled trial of cardioprotective diet in patients with recent acute myocardial infarction: results of one year follow up. <i>BMJ</i> 1992;304: 1015-1019).

<i>Ann Intern Med</i>	–
<i>JAMA</i>	–
<i>Science</i>	Kennedy D. Editorial expression of concern. <i>Science</i> . 2006;311:36. (Regarding: Hwang WS <i>et al.</i> Patient-specific embryonic stem cells derived from human SCNT blastocysts. <i>Science</i> 2005;308:1777-1783).
	Kennedy D. Editorial expression of concern. <i>Science</i> . 2006;314:592. (Regarding: Deb K <i>et al.</i> Cdx2 gene expression and trophectoderm lineage specification in mouse embryos. <i>Science</i> 2006; 311:992-996).
<i>Nature</i>	–
<i>Proceedings of the National Academy of Sciences USA</i>	Cozzarelli NR. Editorial expression of concern. <i>Proc Natl Acad Sci U S A</i> . 2003; 100:11816. (Regarding: Leadon SA, Cooper PK. Preferential repair of ionizing radiation-induced damage in the transcribed strand of an active human gene is defective in Cockayne syndrome. <i>Proc. Natl. Acad. Sci. USA</i> 1993;90:10499-10503).
<i>Cell</i>	–

* Data were collected by searching the PubMed with the combination of the term “expression of concern” and list of all published articles in individual journals retrieved from the Journals Database of the PubMed.

Figure 1. The number of abstracts (bars) submitted to five Peer Review Conferences (PRC) and the number of resulting publications (line) in the Medline/PubMed database. Source: Drummond Rennie, MD; Deputy Editor, *JAMA*.

